Building Reassurance against eye Discomfort and Irritation under Germicidal UV Exposure (BRIDGE)

Request for Proposal (RFP)

I. Overview Information

Funding Opportunity Title:
Building Reassurance against eye Discomfort and Irritation under Germicidal-UV Exposure (BRIDGE)

Announcement Type:
Initial Announcement

Important Dates:

- Posting Date: December 6, 2023
- Optional Teaming Profile: Rolling Deadline; submit as early as possible to connect with other researchers (SUBMIT HERE)
- Registration Deadline for Optional Information Session: December 18, 2023, 12:00PM ET (REGISTER HERE)
- Optional Information Session: December 19, 2023 11:30 am -1:30 pm ET
- Abstract Due Date: January 8, 2024, 11:59 pm ET (SUBMIT HERE)
- Full Proposal Due Date: February 5, 2024, 11:59 pm ET

Concise Description of the funding opportunity:
Primary Purpose:

- Determine the levels, if any, at which irritation/discomfort is experienced under far-UVC exposure, and how quickly any such symptoms disappear after exposure
- Establish mechanism and cause of possible human eye irritation/discomfort under far-UVC exposure
- Develop satisfactory and sufficient models to predict possible far-UVC-induced effects that contribute to irritation/discomfort mechanisms in human eyes

Out of scope:

- Proposals that primarily cover already known effects of far-UVC exposure that are not directly related to human eye irritation/discomfort

Anticipated Individual Awards:
Blueprint Biosecurity anticipates making multiple awards. Cost-effectiveness is a key criteria of evaluation, and we currently expect competitive proposals to be in the range of $100,000 USD.

Types of Funding that May be Awarded:
Milestone-based contracts

Contact Information:

- **Technical POC:** Richard Williamson, Far-UVC Program Director
- **RFP Email:** BRIDGE@blueprintbiosecurity.org

II. Program Information

A. Introduction

Blueprint Biosecurity's mission is to achieve breakthroughs in humanity's capability to prevent, mitigate, and suppress pandemics. We aim to do this by providing actionable roadmaps, which we call Blueprints, for accelerating and derisking countermeasures and then tackling the main bottlenecks to realizing progress.

Recently highlighted by the COVID-19 pandemic, the need for safe and effective disinfection solutions is vital to prevent pandemics and improve global health. Far-Ultraviolet-C (far-UVC) light, emitted between approximately 200–240 nm, is a promising disinfection technology with the potential to transform the suppression of airborne transmission in the built environment. Disinfection efficacy has been demonstrated in the lab against endemic pathogens of perennial public health concern such as influenza and coronaviruses, but with its broad mechanism of action it may also be able to provide protection against 'Disease X' - any yet unknown pathogen of pandemic potential.

In this program, Blueprint Biosecurity seeks to add evidence demonstrating the safety of human eye exposure to far-UVC. Through developing a more comprehensive understanding of possible mechanisms of ocular irritation and discomfort, we aim to further reassure the public, regulators, and standards bodies that far-UVC is safe. In particular, we see a need for more direct evidence in human subjects, and as well as potentially *in vivo*, *ex vivo* and *in silico* models, to inform robust standards and guidelines for far-UVC deployment.

B. Background

Unlike UV-A and UV-B, UV-C light (100–280 nm) from the sun is filtered by the ozone layer and does not reach the surface of the Earth. Terrestrial organisms are not naturally exposed to UV-C light, and UV-C exposure often overwhelms the intrinsic processes for protection against or repair of UV-induced damage. UV-C light has strong and reliable germicidal effects—previously demonstrated at the 254-nm emission of mercury vapor lamps—that have been used for nearly a century to sterilize unoccupied rail cars, buses, and public buildings (e.g., schools)[1,2]. 254nm UV-C exposure inactivates pathogens by inducing RNA or DNA damage, and thus preventing multiplication and infection.

Direct exposure to 254-nm UV-C light has detrimental human health outcomes including skin inflammation and reddening (erythema), and photokeratitis and photoconjunctivitis in the eyes. This limits application to upper room disinfection or unoccupied spaces. Recent research identified far-UVC wavelengths with similar disinfection potential to 254 nm while showing minimal adverse health impacts[3-11]. Current research, primarily focused on 222 nm, shows far-UVC is mostly absorbed by the stratum corneum in the case of skin, and in the case of eyes the superficial epithelial cells of the cornea and potentially the tear film. A recent review of skin and eye safety evidence can be found in 'Assessing the safety of new germicidal far-UVC technologies' by Görlitz et al., 2023.

Currently, most eye safety tests for UV light look at endpoints such as cyclobutane pyrimidine dimers (CPDs) or corneal surface defects to indicate damage has occurred. These markers are important for determining exposure guidelines for human safety. However, the eye may be irritated and subjective discomfort experienced independent of these markers of damage. Discomfort, no matter how mild, could lead to pushback against adoption of such a novel and promising technology. Furthermore,

[1] Bergman, 2021. [2]Reed, 2010. [3]Kousha et al., 2023. [4]Eadie et al., 2022. [5]Ivanova et al., 2022. [6]Welch et al., 2022. [7]Buonanno et al., 2020. [8]Fukui et al., 2020. [9]Yamano et al., 2020. [10]Buonanno et al., 2017. [11]Buonanno et al., 2016.

endpoints such as CPDs are highly invasive to study in live human subjects, potentially making noninvasive identification of discomfort and irritation markers a more straightforward method for gathering robust human data.

Hence, Blueprint Biosecurity seeks to understand what (if any) level of eye exposure to far-UVC leads to subjective ocular discomfort, and the potential methods of measuring and understanding ocular irritation. Any identified irritation biomarkers can then be used to 1) study ocular irritation and 2) determine the highest far-UVC dose for pathogen sterilization that does not induce ocular irritation.

For more information on eye irritation and discomfort under far-UVC exposure, please see the presentation by Dr Kazunobu Sugihara at the International Congress on Far-UV Science and Technology in 2023, in particular minutes 18-26.

C. Program Description/Scope

Blueprint Biosecurity's objective is to understand the dynamics of any potential far-UVC-induced eye irritation, discomfort, and tearing. We expect this to require multiple stages, potentially including:

1. Establish what (if any) relevant far-UVC exposure threshold at which eye irritation and discomfort is experienced.
2. Establish the mechanisms, causes, and/or biomarkers of human eye irritation under far-UVC exposure.
3. Establish a framework for developing satisfactory and sufficient models or tests to determine far-UVC-induced changes that may contribute to irritation mechanisms in eyes. Proposers are free to propose different stages or phases of work that support meeting the program objective.

Identification of irritation and tearing mechanisms is required for a complete understanding of far-UVC effects on the eyes as well as establishing effective and safe exposure threshold limit values (TLVs). Determination of mechanisms should be directly relevant to humans and should inform the choice of biomarkers for eye irritation and discomfort.

Developing satisfactory and sufficient models or tests for far-UVC-induced changes may leverage currently used technologies (tear break-up time, optical coherence tomography, etc.) or alternative technologies (spectroscopic analysis, machine learning, single-photon standoff detection, etc.) to achieve the goal. Identified biomarkers must require neither invasive procedures nor require multiple sampling, and should be easily accessible for collection/analysis. Regardless of the method chosen, biomarkers must be successfully validated and show measurable readings before damage occurs or before perceptible irritation. Establishing the time period over which markers disappear after exposure and/or any repair mechanisms work is crucial. Proposals should not address already known effects of far-UVC exposure that are not directly related to human eye irritation.

In scope:

- Non-invasive biomarkers (tear samples, optical imaging, spectroscopy, etc.) measurable in an out-patient setting to minimize undue personal burden, cost, or pain.
- Alternative technologies (spectroscopy, optical, etc.) which can measure actionable and reliable biomarkers.
- Novel or expansion of current computational approaches (machine learning, artificial intelligence, etc).
- Accurate modeling of photo-biological interactions between photons and biological substrates (proteins, lipids, skin, tear film, etc.).

- Creation of a catalog of the response to Far-UVC for various biological materials in the human eye (protein, lipids, etc.). Simple building blocks, as proxies, for complicated biological structures may be used as long as they accurately resemble the response to far-UVC.
- Small clinical, in vivo or ex vivo studies.
- Use of external laboratories to validate eventual targeted 'point-of-care' biomarker tests.

Out of scope:

- Biomarkers that require developing novel measurement instrumentation, have prohibitively high costs for adoption, or require extensive downstream processing or analysis.
- Development of procedures that require external laboratory-based tests or analyses.
- Already known biomarkers of far-UVC exposure that are not directly related to human eye irritation.
- Incremental advances in new techniques/technologies for currently used biomarkers with minimal use in assessing irritation or far-UVC effect.
- Incremental advances in modeling over current established practices.
- Hardware development for running modeling simulations.

D. Schedule/Milestones

Proposed project timelines should be no longer than 9–12 months from contract award, with at least one proposed interim milestone approximately every 3 months, which are potentially tied to contractual payments.

E. Deliverables

Blueprint Biosecurity will negotiate project deliverables with individual awardees. Blueprint Biosecurity anticipates that, at a minimum, selected awardees will provide the following:

- Monthly technical reports, describing progress made on the specific milestones as well as anticipated future progress, any problem areas, and plans to overcome these.
    - Accompanying virtual meetings to describe and discuss the technical progress
- A stage completion report submitted within 30 days of defined project phases, summarizing the research done.
- Source code and other appropriate media for any models developed over the course of the program.
    - Code should be well-documented and follow industry best practices for readability. The agreement between Blueprint Biosecurity and each awardee will require an assignment of intellectual property rights in the code to Blueprint Biosecurity, which will then make the code available under a license complying with the Open Source Definition of the Open Source Initiative.

Depending on the proposer's approach and plan, other examples for deliverables may include:

- Planned experimental protocols; analytical plans; experimental data, results, and analysis; experimental analysis scripts; simulation models, data, results, and analysis; model validation data; publications; intermediate and final versions of software libraries, code, and APIs, including documentation and/or user manuals; or design documents.
- Periodic financial reporting.

III. Award Information

A. General Award Information

Blueprint Biosecurity hopes to provide multiple awards. No specific award quota exists, with the level of funding depending on the quality of proposals. Cost effectiveness is a key criteria of evaluation, and we currently expect competitive proposals to be in the range of $100,000 USD. Blueprint Biosecurity will consider proposals that significantly exceed this amount; such requests will require additional justification and evaluation. See Section VI.A for more information about evaluation criteria.

Blueprint Biosecurity reserves the right to:

- select for negotiation all, some, one, or none of the proposals received in response to this RFP;
- conduct discussions with proposers if it is later determined to be necessary;
- select for award entire proposals, or only specific portions;
- fund awards in increments or by milestone achievements
    - There may be options for continued work and additional funding following completion of the proposed work;
- request additional documentation once the award instrument has been determined (e.g., representations and certifications); and
- stop considering a proposal for award if: all parties involved fail to reach agreement on terms (award, technical, milestones, etc.) within a reasonable time; the proposer fails to provide requested additional information; or the application is deemed noncompliant with the requirements of the RFP at any time.

Proposals identified for negotiation may result in a milestone-based contract, depending on the nature of the work proposed, the required degree of interaction between parties, and other factors.

Awardees are responsible for ensuring that research is conducted in compliance with rules set forth by relevant institutional, local, and national research regulatory bodies such as Institutional Review Boards (IRBs) and/or Institutional Ethics Committees (IECs).

Blueprint Biosecurity retains sole discretion to select awards and to negotiate all terms and conditions with selectees.

B. Fundamental Research

Blueprint Biosecurity expects the results of all research performed under this RFP can be broadly published and shared to the scientific community. This contrasts with proprietary research in which development, design, production, and product utilization are restricted to corporate interests.

Hence, Blueprint Biosecurity expects that all outputs from efforts funded by this RFP will be published as open-access, or open-source, as relevant. Proposers should clearly indicate in their proposals if any portion of the research is proprietary. If so, they should clearly indicate what parts they intend to protect, why, and if/how Blueprint Biosecurity may adequately share such information with other parties to provide the greatest impact in accordance with our mission.

C. Administrative Overhead Policy

Blueprint Biosecurity contracts allow for indirect costs at a maximum rate of 10% of total direct costs.

IV. Eligibility Information

A. Eligible Applicants

Submissions are welcome from all responsible sources, inside and outside the United States, capable of satisfying the requested work in this RFP. We will be unable to provide awards to any entities subject to United States sanctions.

B. Organizational Conflicts of Interest

Proposers are required to disclose all potential real or perceived organizational conflicts of interests, such as

- Current and historical funding received from far-UVC industry or competitor industries
- Personal ties between team members and the far-UVC industry or competitor industries
- Financial interests or advisory relationship to far-UVC industry or competitor industries
- Personal ties to the Blueprint Biosecurity team

V. Guidelines for Submissions (Application and Submissions Information)

A. General Guidelines

All Microsoft Word or PDF submissions should be written in English with 11-point font type of Times New Roman, Arial, or Calibri. Font size may be 10-point for figures, tables, and charts. All documents should clearly identify the proposer organization and proposal title (or acronym) along with this RFP's identifier, "BRIDGE". All pages should be single-spaced, and use Letter format (8.5-inch x 11-inch) with 1-inch margins.

Blueprint Biosecurity requests that proposals do not include brochures or marketing materials; please provide only information relevant to the submission requirements or evaluation criteria.

To abet a fair, equal, and expedited review process, Blueprint Biosecurity requires all proposals to use the templates provided with this RFP. Though care has been taken to ensure the templates and the RFP guidance align, in the event of a contradiction, please follow the guidance provided in this document.

In an effort to provide focus on meeting the program objectives, proposers should limit their discussions about motivation for the proposal or potential impact.

B. Abstract Guidelines

Blueprint Biosecurity requires proposers to submit an Abstract. Please use the provided templates for the submitted Abstract (see Attachment A), and the accompanying single-slide Powerpoint overview (see Attachment B). Proposers may opt to provide supplemental papers for consideration as part of the evaluation, though these may not be reviewed in their entirety.

An Abstract should not exceed 4 single-sided pages. References/bibliography and supplemental papers do not contribute to the page limit.

Abstracts should include a rough order of magnitude (ROM), which provides estimates for: direct labor, subcontractors, materials/equipment, and travel/other direct costs. Blueprint Biosecurity encourages healthy and open dissemination of the findings from this program to the scientific community. As such, estimates should (where appropriate) include reasonable costs for travel and registration to conferences,

and for open-access publications. Capital expenditures (>$10,000) are allowable if necessary, but will be subject to additional justification at the Proposal stage.

C. Proposal Guidelines

A full proposal will consist of a technical volume and a cost volume. Blueprint Biosecurity will provide templates and further guidance after Abstract reviews.

VI. Application Review Information

A. Evaluation Criteria

All received proposals will be evaluated by the selection committee using the following criteria; note that the listed criteria are in descending order of importance.

1. Overall scientific and technical quality

Proposals will be evaluated for innovation, achievability, reasonableness, and completion. Proposals should provide a comprehensive and logical sequence for completion, containing timelines, and all proposed deliverables. Additionally, how well the proposed research addresses the program objective will be evaluated. Proposals will also be evaluated for the schedule realism, which includes how well the proposed work aligns with the anticipated schedule. Technical risks must be addressed with planned and feasible mitigation strategies included.

2. Proposer's capability and/or related experience

Proposals will be evaluated for the technical team's experience and expertise required for achieving the proposed work. Proposals should establish prior experience in similar efforts that demonstrate adherence to proposed budget and schedule while delivering the proposed technical work. We request information about current or ongoing efforts related to those described in this RFP—potentially listing the funding agency, timeline, summary of progress/results, and/or award value—to assist our evaluations and assessments of capability, experience, and expertise (Attachment C).

3. Cost effectiveness/realism/reasonableness

Each proposal will be subject to cost analysis to ensure effective, reasonable, and realistic proposed costs for technical work and equipment, labor, and other associated program costs (e.g., travel, publication, conference fees). By 'cost effectiveness', we mean the ability to extract the most useful information for this RFP per dollar spent. By 'cost realism' we mean the necessity of each expense to address the program objectives. By 'cost reasonableness', we mean the justification of the monetary value of those expenses. For example, 'cost realism' would address whether a specific piece of equipment is required for the project, and 'cost reasonableness' would address whether the budgeted cost of that equipment is reasonable.

B. Proposal Evaluation Process (Review and Selection Process)

It is the policy of Blueprint Biosecurity to ensure impartial, equitable, comprehensive evaluations of Proposer Submissions. The review team will consist of at least two employees of Blueprint Biosecurity, as well as a small number of outside contractors/consultants/experts.

Review team members will individually evaluate and comment on the proposals. A subsequent discussion will weigh the (de)merits of each proposal to inform funding decisions. Final funding decisions will be made by the members from Blueprint Biosecurity.

Blueprint Biosecurity will identify and execute a mitigation plan for identified conflicts of interests between review team members and any proposals. Our Chief Operating Officer, who will not be part of the review team, will manage this process, and adjudicate conflicts.

C. Handling of Proposal Submissions and Proprietary Information

Blueprint Biosecurity policy is to treat all submissions as protected information, and to only disclose their contents to authorized personnel strictly for the purposes of evaluation. Note that despite the use of any restrictive notices on submitted materials, support contractors may handle submissions for administrative purposes and/or to assist with technical evaluations. All Blueprint Biosecurity support contractors performing this role are expressly prohibited from performing technical research sponsored by Blueprint Biosecurity, and are bound by appropriate nondisclosure agreements. Input on technical aspects of the proposals may be solicited by Blueprint Biosecurity from other consultants/experts who are strictly bound by the appropriate non-disclosure agreements.

No proposal submissions will be returned. Upon completion of the Proposal Evaluation process, an electronic copy of each proposal will be retained by Blueprint Biosecurity, and all other copies will be destroyed.

VII. Award Administration Information

A. Selection Notices

1. Types and Delivery of Notices

The following notices will be provided as applicable:

- Notice of Disinclination (for proceeding from Abstract to full Proposal)
- Notice of Recommendation (for proceeding from Abstract to full Proposal)
- Notice of Non-Selection (for proceeding from Proposal to negotiation of an Award)
- Notice of Selection (for proceeding from Proposal to negotiation of an Award)

All notices will be sent by email to the Technical and Administrative POCs identified on the abstract/proposal cover sheet.

2. Abstracts

Blueprint Biosecurity will respond to abstracts with either a Notice of Recommendation or a Notice of Disinclination, along with a brief description containing feedback. All proposers may still submit a full proposal, regardless of Blueprint Biosecurity's response to the provided abstract. All conforming full proposals will be reviewed according to the evaluation criteria listed in Section VI.A; these reviews will be independent of the abstract reviews, though consideration may be given to the proposers' responses to feedback provided.

3. Proposals

After proposal evaluations are complete, proposers will be notified as to whether their proposal was selected for award negotiation. For proposals that receive a Notice of Selection, the funding negotiation could be for the proposal in whole or in part. If a proposal has been selected for award negotiation, Blueprint Biosecurity will initiate those negotiations following the notification.

VIII. Other Information

A. Information Session

Blueprint Biosecurity will host a virtual Information Session on December 19th at 11:30 am - 1:30 pm ET. The purpose of the Information Session is to provide a description of the planned program, and answer questions from all interested parties. Pending time availability, potential proposers may provide a brief introduction to their team, capabilities, interests, and potential needs for collaboration. Advanced registration is required. Attendees must submit their registrations by 12pm ET December 18th through this link.

Attendance at the Information Session is not required to submit an abstract or full proposal for this RFP.

B. Frequently Asked Questions (FAQs)

Please email all administrative, technical, and contractual questions to BRIDGE@blueprintbiosecurity.org. Questions about this program that are not sent to this email may not be replied to. All questions must be in English, and must include the name, email address, and telephone number of a point of contact.

Where Blueprint Biosecurity deems it to be helpful for all interested parties to the RFP, answers to questions (paraphrased where necessary to protect proposer information) may be posted in a public FAQ on Blueprint Biosecurity's website.

C. Collaboration

Blueprint Biosecurity encourages proposers to collaborate with other technically qualified individuals to achieve the BRIDGE program goals. To aid with this effort, please submit an optional Teaming Profile through this form. This information will be collated and shared with all other teams who share their teaming profiles. There is no deadline, but we recommend submitting early to identify potential collaborators.

IX. Attachments

A. Abstract Template (docx)

B. Abstract Summary Slide Template (pptx)

C. Ongoing Efforts and Funding (docx)

X. Disclaimers and Important Notes

NOTE: Blueprint Biosecurity will not provide reimbursement for costs incurred in responding to this RFP.

Blueprint Biosecurity intends to conduct individual discussions with respondents as necessary to gain a full understanding of the responses submitted. Blueprint Biosecurity will contact respondents via email.

To the maximum extent possible, please submit non-proprietary information. If absolutely necessary, responses can contain confidential or proprietary information, but only if it is clearly marked as "Proprietary" and only if you have the authority to disclose that information to Blueprint Biosecurity. Blueprint Biosecurity will disclose submission contents labeled "Proprietary" only for the purpose of review by Blueprint Biosecurity staff and contract support personnel who have agreed with Blueprint Biosecurity to maintain the confidentiality of such information. Please note that Blueprint Biosecurity may already be in possession of, or separately may obtain, information similar or identical to your proprietary information, and Blueprint Biosecurity remains free to use any of that information with the applicable restrictions from those sources, possibly including no restrictions.